Panasonic
Broadcast Systems

D·3 1/2″ DIGITAL

AJ-D350

Composite Digital Studio VTR

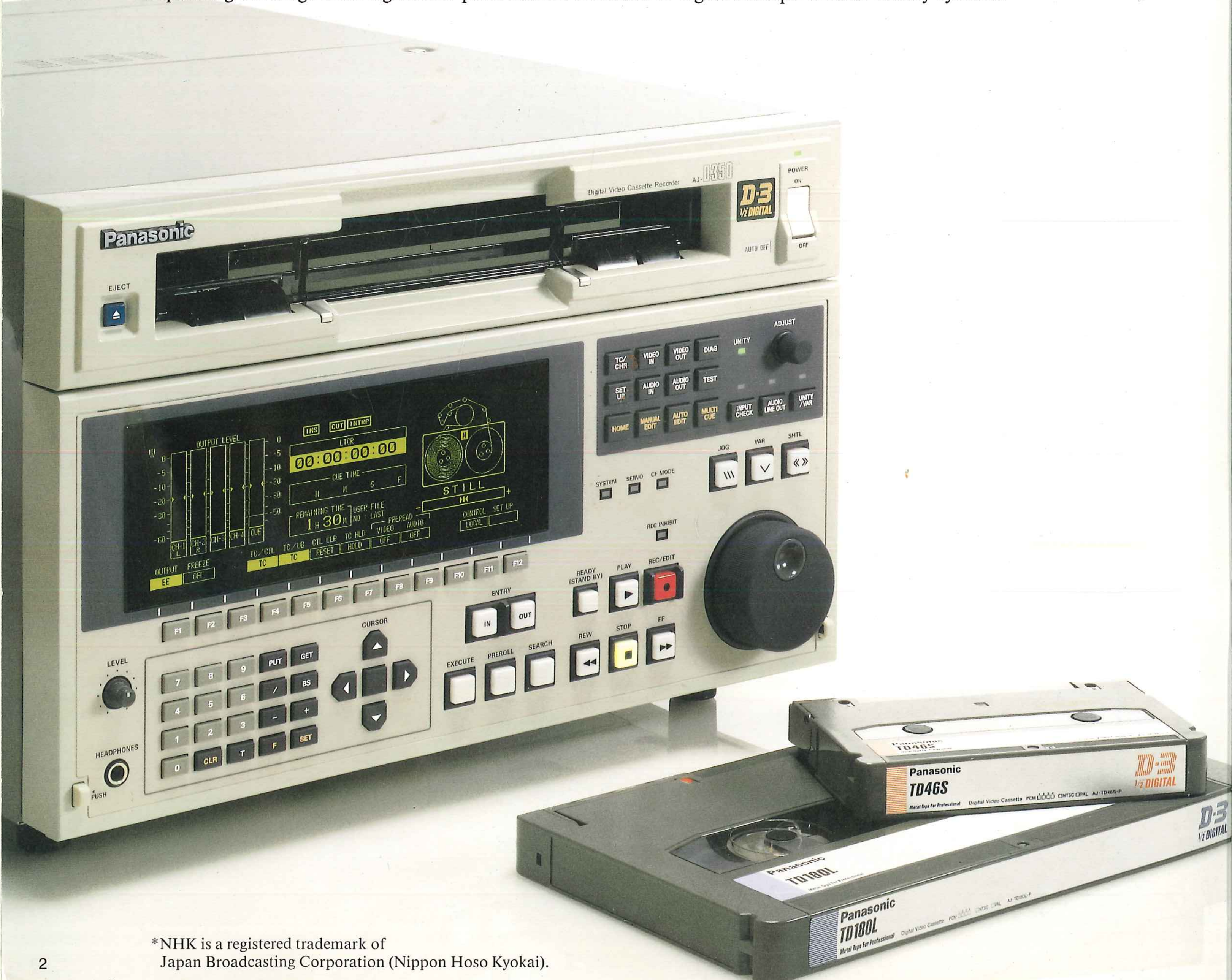
(PAL)

Advanced-Format Digital VTR: Another 1/2″ First

The D-3 1/2″ DIGITAL AJ-D350 composite digital studio VTR takes full advantage of the outstanding D-3 digital recording format developed by NHK* of Japan. D-3 VTRs, including the AJ-D350, have been officially selected as the broadcast VTRs for use at the 1992 Summer Olympic Games in Barcelona, Spain.

In this advanced format, digital video signals are recorded onto MII-proven, 1/2-inch cassette tapes at more than double the recording density of other digital formats; and this format also delivers 4 channels of PCM sound to provide a comprehensive digital solution to overcoming dubbing-related picture and sound degradation. The D-3 1/2″ DIGITAL AJ-D350 VTR provides multiple interface capability, including I/O connections to other digital or analogue equipment.

Development of the AJ-D350 is another key step towards availability of the all-digital VTR production system. This goal is well on the way to becoming a reality, with development and production well underway on equipment spanning the range from digital one-piece camera recorders to digital multiple cassette library systems.



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*NHK is a registered trademark of Japan Broadcasting Corporation (Nippon Hoso Kyokai).

D-3 1/2" DIGITAL

High Quality

Exceptional Picture Quality

The advanced digital recording format of the AJ-D350 incorporates 8-14 coding method and powerful error correction capability, as well as high-performance laminated amorphous video heads, to produce a broad, 7.5 MHz video bandwidth. This combines with a 54 dB video S/N ratio to deliver exceptional picture quality.

4-Channel PCM Audio

The AJ-D350 is equipped with 4 PCM audio channels. Sound quality is excellent, boasting a frequency response from 20 Hz to 20 kHz (±0.5 dB) and a wide dynamic range (20 bits). A single longitudinal audio channel (audio cue track) is also provided.

Multigeneration Recording

Recording is digital using the AJ-D350. When dubbing in the digital domain (In/Out; D-sub, 25-pin),therefore, there is virtually no quality degradation even after 20 or more generations. This offers unprecedented flexibility in programme production, while assuring top quality performance even when using analogue composite In/Out.

Compact Size

High Density, Compact Cassette Tape

Compared to other digital formats, D-3 compact cassette tape is 1/3 narrower and records 1/3 slower.
Tape consumption is reduced by about 58%. These easy-to-handle cassettes — about half the size of other digital format cassettes — require less space and lower power consumption. In addition, extended high-density recording is also possible.
S Cassette: Max. 64 minutes+
M Cassette: Max. 125 minutes+
L Cassette: Max. 245 minutes+

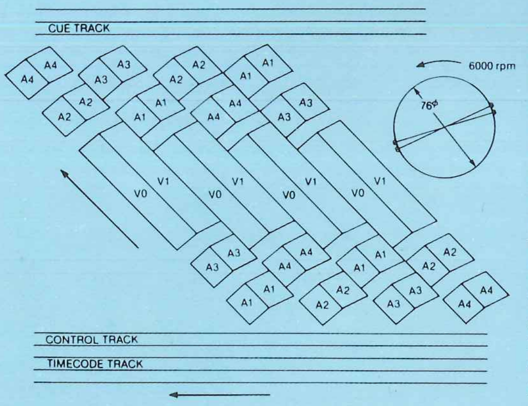
Single-Format Production with Three Cassette Sizes

With any D-3 cassette, single-format production from field recording with the AJ-D310 digital camera/recorder to editing with the AJ-D350 unit all the way to on-air playback with the M.A.R.C.-1/2″ Digital machine is possible.

Small Size and Weight, Low Production Costs

Measuring 424 × 265 × 667 mm (W × H × D), the AJ-D350 is mountable in a 6-unit, 19-inch rack. Combine this size with a manageable weight of 48 kg., and you have convenience that enables easy installation in studios or OB vans, with minimal space required for both the unit itself and tape storage.

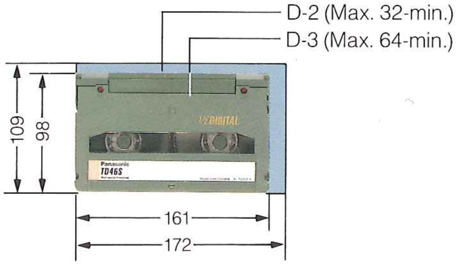
D-3 (1/2-inch Cassette Composite Digital VTR) Format



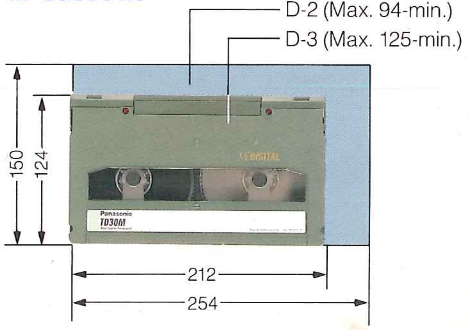
The advanced digital format records 8 tracks onto the tape for one field, using 8-bit quantization of the composite video signal with a 4 Fsc (17.7 MHz) sampling frequency. Four channels of PCM sound are provided by 16-20 bit quantizing with a 48-kHz sampling rate. The channels are divided into fields (1/50 sec.), shuffled, then recorded onto both tracks by the same heads used for video. This signal is recorded onto 1/2″ metal tape at more than twice the recording density of other formats. Despite such high-density recording, reliability of the D-3 format goes beyond other systems thanks to features like the advanced 8-14 coding method, high-performance error correction, and a special* PCM audio track arrangement.

Cassette Size Comparison

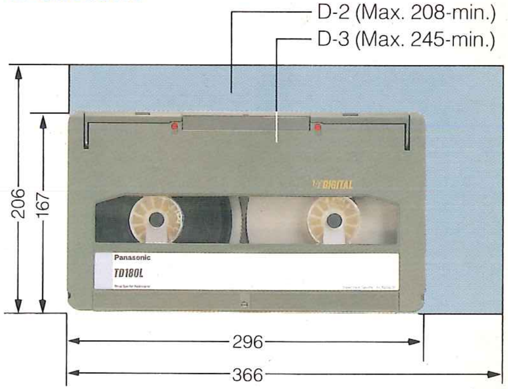
S-Cassette

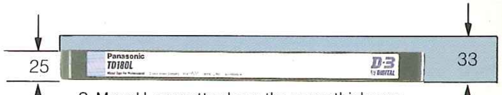


M-Cassette



L-Cassette





S, M and L cassettes have the same thickness

Unit: mm

Easy Operation

High-Speed, High-Quality Search

Shuttle search at up to 100x normal speed in forward and reverse lets you reach edit points fast for quick editing. The D-3 format also permits viewing of colour images with minimal degradation while searching.

Auto Tracking with Piezo Element

The advanced auto tracking function uses a piezo element to achieve noiseless Still and Slow mode playback from −1x to 3x normal speed.

Programme Play

Playback speed can be adjusted ±15% of normal speed in 0.1% steps. This allows time compression or expansion for on-air broadcasting or production of commercials and programmes using an external pitch controller.

Confidence Playback

Full confidence playback allows real-time monitoring of pictures and sound while recording. The confidence playback function can also be used to check the recording signal automatically.

Large Electroluminescent (EL) Display

A large (600 × 200 dot) EL display shows VTR status during recording and playback. Status is also graphically displayed, showing tape size, loading status, running direction, speed, and remaining tape time. The 12 menu keys on the upper right side control 12 different menu displays for checking VTR data. Settings can be made directly on the control panel, using the 12 functions keys below the EL display, which provide discrete functions in different display modes.

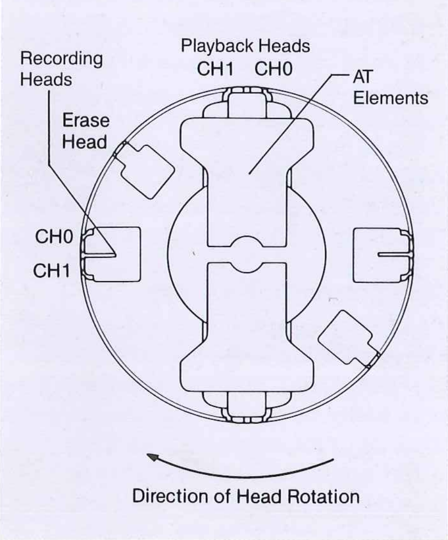
Up to 10 User Files

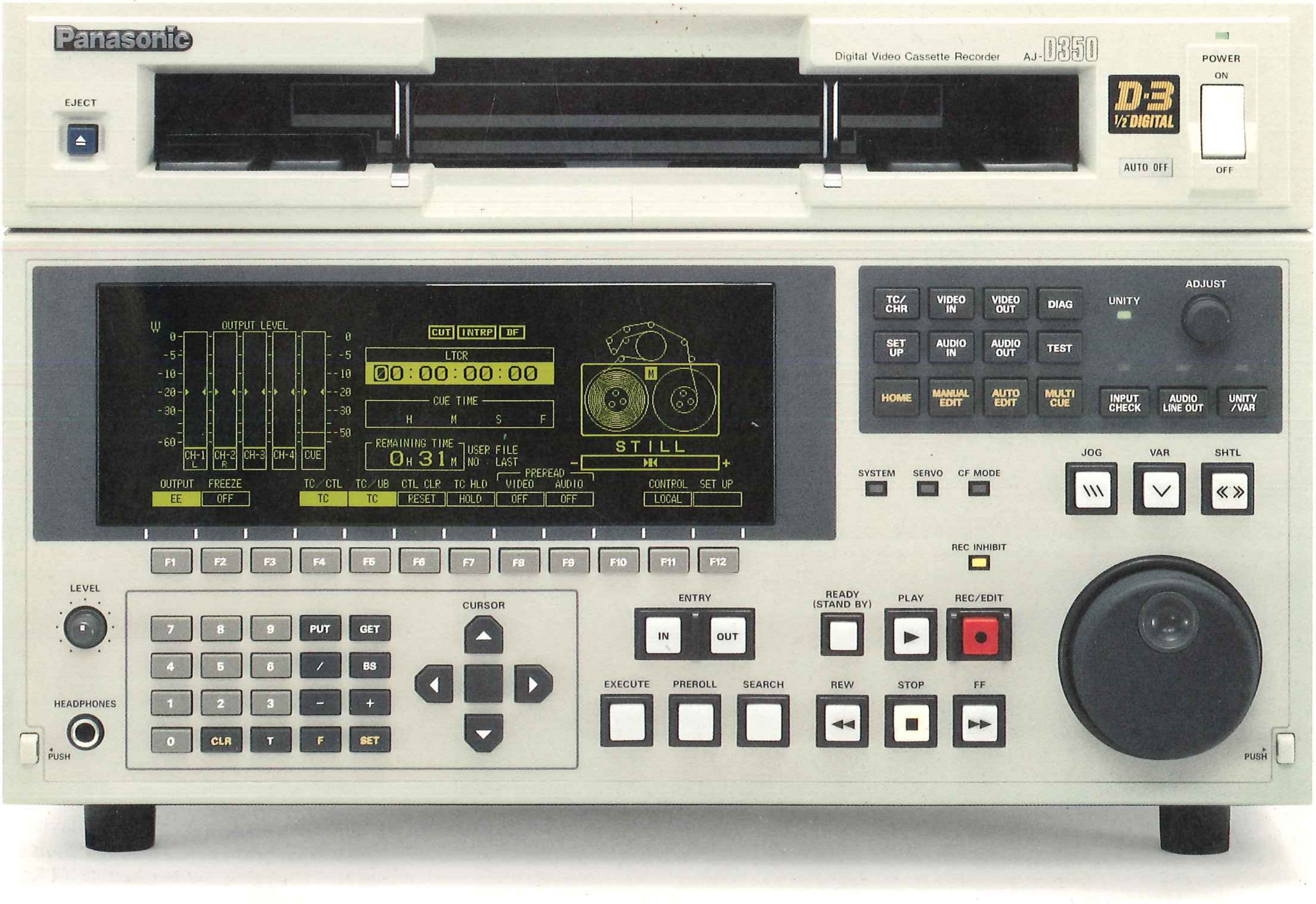
The AJ-D350 lets you store up to 10 sets of operating parameters in memory, then use a simple key operation to switch instantly among them. By storing the settings for on-air play, edit play, edit record and ordinary record in advance, you can minimize setup time on location.

Additional Operating Features

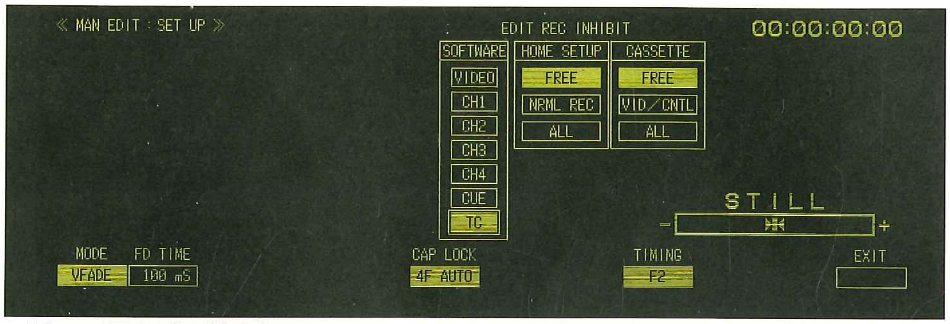
- Quick loading and unloading—only 5 seconds
- Store and access up to 10 cue points
- Tiltable operation panel can be removed and operated remotely via a separate rear connector
- EBU time code generator/reader
- Independent Record inhibit
- Audible key touch and alarm indication

AJ-D350 Multihead System





Examples of EL Display Menu

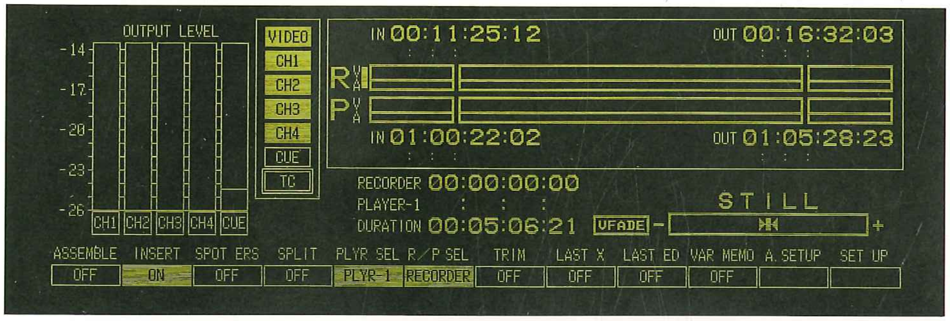


00:00:00:00

SOFTWARE: VIDEO, CH1, CH2, CH3, CH4, CUE, TC
HOME SETUP: FREE, NRML REC, ALL
CASSETTE: FREE, VID/CNTL, ALL

MODE VFADE
FD TIME 100 mS
CAP LOCK 4F AUTO
TIMING F2
EXIT

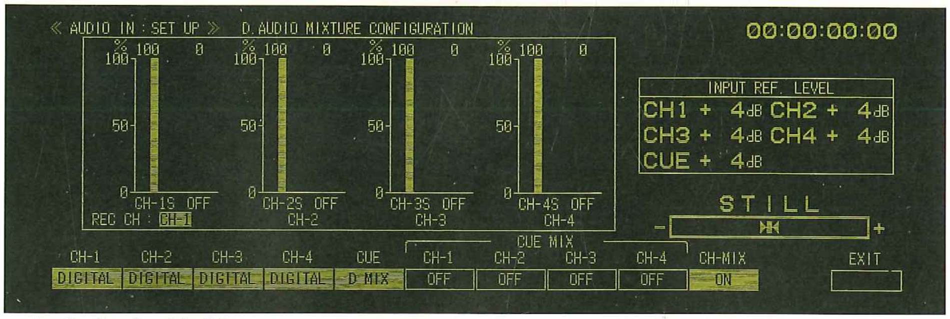
• Manual Edit, Set Up Menu



IN 00:11:25:12 OUT 00:16:32:03
IN 01:00:22:02 OUT 01:05:28:23
RECORDER 00:00:00:00
PLAYER-1 : : :
DURATION 00:05:06:21 VFADE

ASSEMBLE OFF
INSERT ON
SPOT ERS OFF
SPLIT OFF
PLYR SEL PLYR-1
R/P SEL RECORDER
TRIM OFF
LAST X OFF
LAST ED OFF
VAR MEMO OFF
A.SETUP
SET UP

• Auto Edit Menu



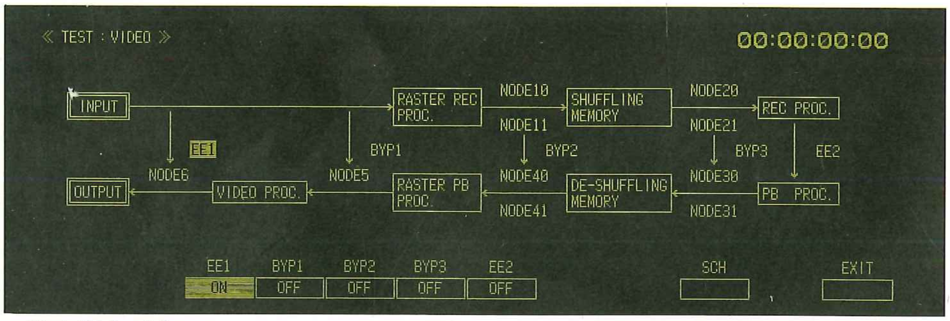
00:00:00:00

CH-1S OFF
CH-2S OFF
CH-3S OFF
CH-4S OFF
REC CH : CH-1

INPUT REF. LEVEL
CH1 + 4dB CH2 + 4dB
CH3 + 4dB CH4 + 4dB
CUE + 4dB

CH-1 DIGITAL
CH-2 DIGITAL
CH-3 DIGITAL
CH-4 DIGITAL
CUE D MIX
CUE MIX: CH-1 OFF, CH-2 OFF, CH-3 OFF, CH-4 OFF
CH-MIX ON
EXIT

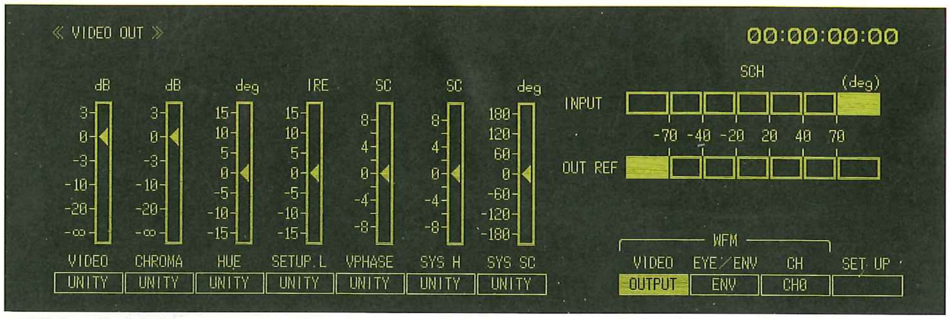
• Audio In, Set Up Menu



00:00:00:00

EE1 ON
BYP1 OFF
BYP2 OFF
BYP3 OFF
EE2 OFF
SCH
EXIT

• Test, Video Menu



00:00:00:00

VIDEO UNITY
CHROMA UNITY
HUE UNITY
SETUP.L UNITY
VPHASE UNITY
SYS H UNITY
SYS SC UNITY

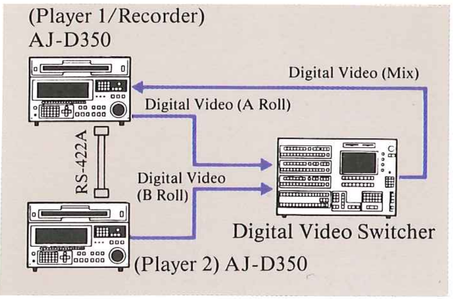
WFM: VIDEO OUTPUT, EYE/ENV ENV, CH CH0
SET UP

• Video Out Menu

Editing Functions

Single-Unit Editing (Read-before-Write)

Just the opposite of confidence playback, this function enables playback and output of the signal before it is recorded on the tape. You can use it for single-unit (read-before-write) editing, for example adding an external effect to the playback signal of the AJ-D350, then sending the signal back to the AJ-D350 for editing. Connecting a second VTR enables A/B roll editing.



Complete Editing Functions

The AJ-D350 provides assemble, insert, and audio split editing functions, as well as spot erase. With the RS-422A control, 1-event editing is possible using two AJ-D350 units, or with one in combination with other types of VTRs.

Independent Audio Editing

Advanced* technology in the AJ-D350 enables independent editing of each audio channel, and eliminates degradation, while preventing interference from other channels. In addition, the AJ-D350 provides the functions of a conventional PCM editing machine, including channel mix and cross-fade editing. The AJ-D350 also lets you listen to the audio portion when searching in Jog/Var mode for easy cueing of audio edits.

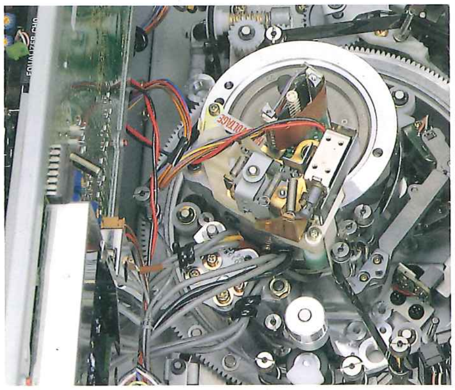
Rotary Erase Heads/Guard Bands

Rotary erase heads were not generally considered necessary in digital recording. The AJ-D350 provides them in order to assure complete erasure of previous recordings, rather than rely upon "over-recording". Guard bands are also provided at the In/Out points to ensure "off track editing". The result is exceptional audio and video quality and robust interchange. Reliable Interchange editing is assured.

Additional Editing Features

- Tape formatting (CTL/LTC) at 3x normal speed for editing preparation
- Selectable Pre-roll, Post-roll, Re-act and Delay Start times
- Continuous processing, even for playback tapes with discontinuous colour framing
- Selection capability for two source VTRs

Reliability



Exceptionally Durable Mechanisms

Tape tension in the AJ-D350 is about 1/4 that of other digital composite VTRs. This reduction was achieved by incorporating all roller-type tape guide posts for smoother transport, except one that requires minimal tape wrap angle. The unit also employs sub-loading during standby, keeping the tape out of contact with the head drum. Together, these features reduce tape wear, lengthen head life, and minimize occurences of dropout and head clogging. Brushless motors and highly abrasion-resistant materials also contribute to dependability. In addition, because non-contact photosensors are used, conventional sensing switch problems are virtually eliminated.

Advanced Circuitry for Extra Reliability

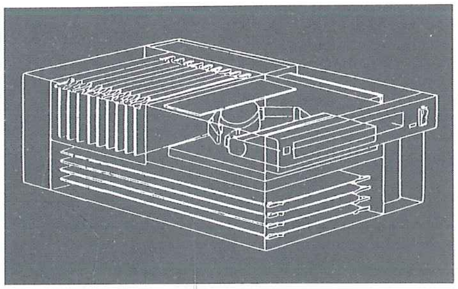
The AJ-D350 employs advanced* LSIs for digital signal processing. Every major circuit uses single-chip construction which, along with the large-scale PLD, serves to reduce the PCB area compared to previous models. Only non-contact, optical position switches are used, to promote smooth operation. The results are apparent in the small overall dimensions, light weight and low power consumption.

Self-Diagnostic System

A built-in self-diagnostic system automatically checks the unit when the power is switched on, and during operation, and shows any irregularity on the front-panel display. Warnings can also be relayed to an external unit via RS-232C, RS-422A or through a GP-IB port. This lets the operator monitor VTR condition during remote operation via a communication linc.

Easy Maintenance

Circuit boards are designed for easy access during routine maintenance or repair. Plug-in circuit boards pull out easily for checking with an extension board, or for replacement. Because all circuitry is isolated from the tape transport section, maintenance work can be done without opening that transport section.



System Interface Capability

User Data Area

The 1/2″ digital format provides a wide, one-line data area of 948 bytes. Anticipating future digital interfacing, this area will allow recording of a variety of information that would not otherwise fit within the time code.

Digital In/Out

Video output is through D-sub 25-pin (10 bit parallel format), and audio output is via AES/EBU standards. This enables quick, easy interfacing with other types of digital equipment.
A serial digital interface converter provides input and output capability for digital serial audio/video via BNC connectors.

Analog In/Out

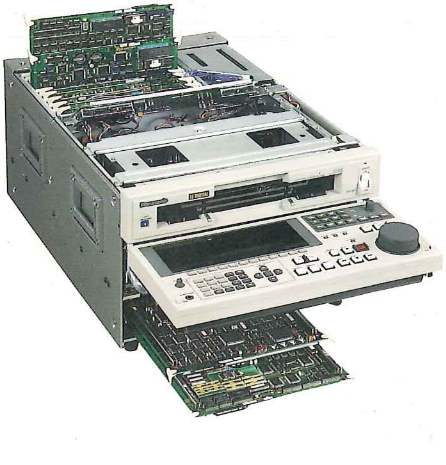
The AJ-D350 is also equipped with input and output terminals for composite video and analog audio, allowing direct connection to your existing system.

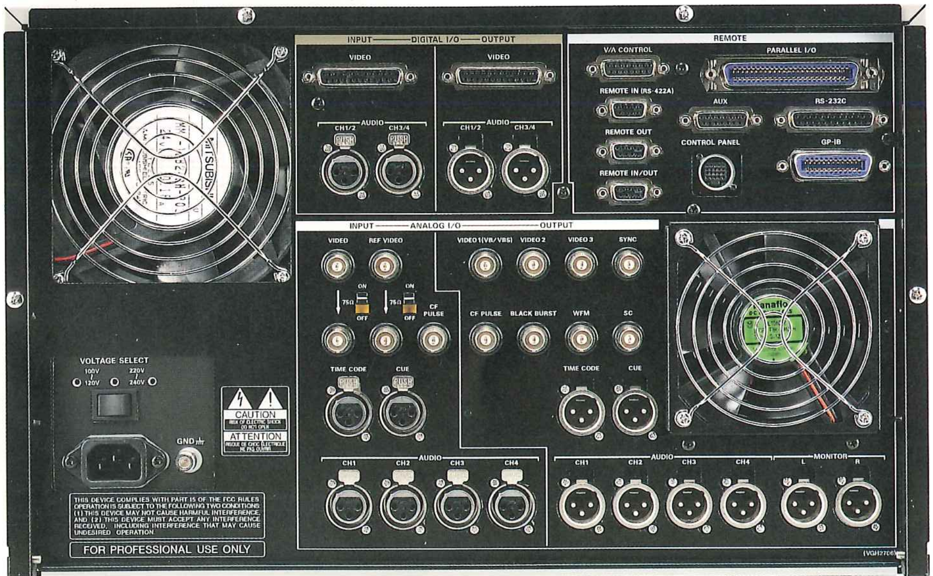
Communications and Control

A 9-pin serial (RS-422A) terminal supports interfacing with virtually all types of editing machines and VTRs used in broadcasting. A 50-pin parallel terminal is also provided for remote control. Data communication with computers is possible through the RS-232C and GP-IB terminals.

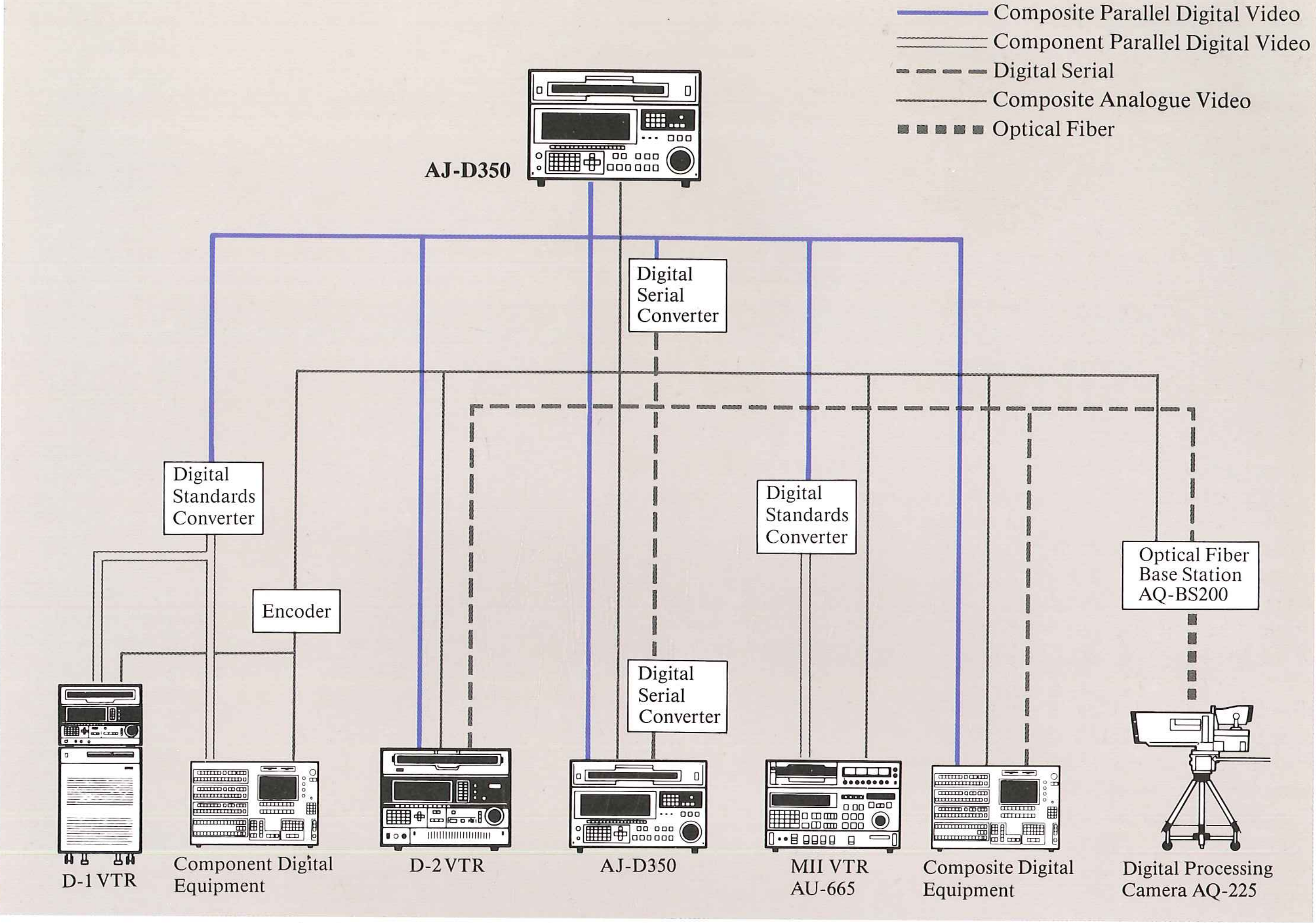
Optional Digital Video Controller

The optional Digital Video Remote Controller, AJ-ER30, enables remote adjustment of up to 4 VTRs' parameters, such as level and phase.



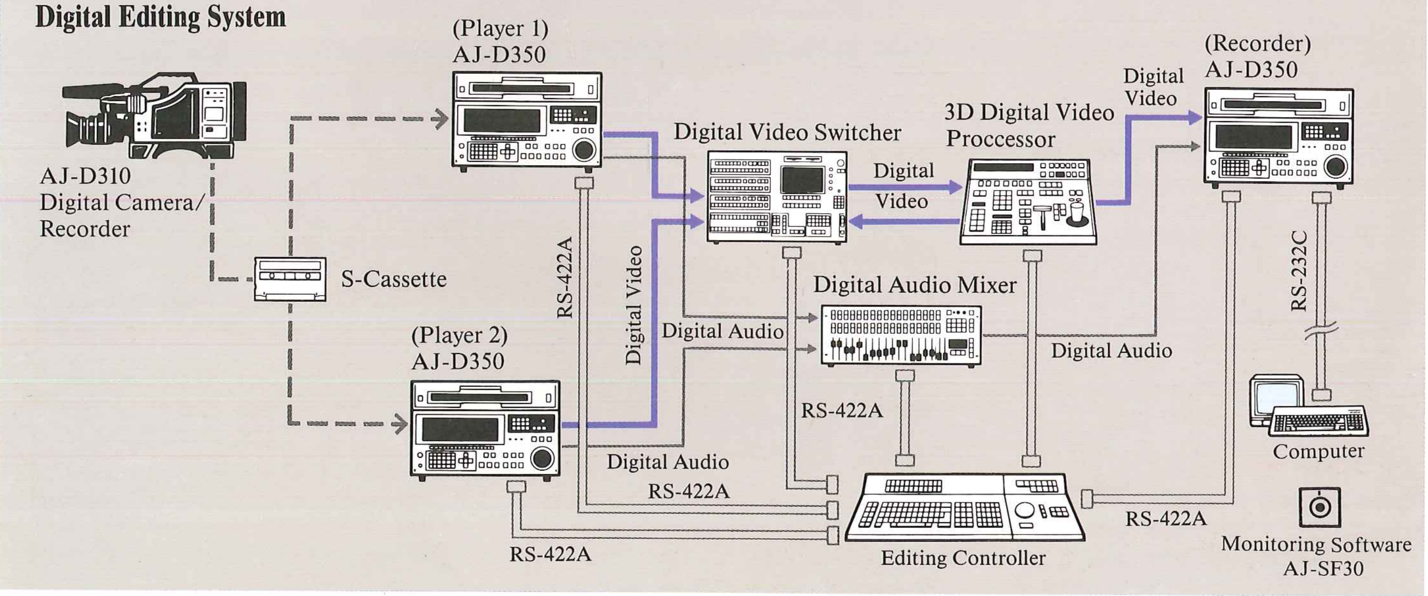

INPUT — DIGITAL I/O — OUTPUT
VIDEO
VIDEO
AUDIO
CH1/2
CH3/4
PUSH
REMOTE
V/A CONTROL
PARALLEL I/O
REMOTE IN (RS-422A)
AUX
RS-232C
REMOTE OUT
CONTROL PANEL
GP-IB
REMOTE IN/OUT
INPUT — ANALOG I/O — OUTPUT
VIDEO
REF VIDEO
VIDEO 1 (VB/VBS)
VIDEO 2
VIDEO 3
SYNC
ON
75Ω
OFF
CF PULSE
CF PULSE
BLACK BURST
WFM
SC
TIME CODE
CUE
TIME CODE
CUE
VOLTAGE SELECT
100V 120V
220V 240V
CAUTION
RISK OF ELECTRIC SHOCK DO NOT OPEN
ATTENTION
RISQUE DE CHOC ELECTRIQUE NE PAS OUVRIR
GND
AUDIO
CH1
CH2
CH3
CH4
MONITOR
L
R
THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.
FOR PROFESSIONAL USE ONLY
(VGH2706)

Digital/Analogue Interface of the AJ-D350 and Other Equipment

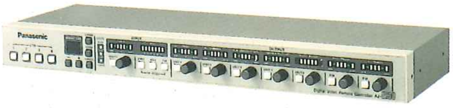


Composite Parallel Digital Video
Component Parallel Digital Video
Digital Serial
Composite Analogue Video
Optical Fiber
AJ-D350
Digital Serial Converter
Digital Standards Converter
Encoder
Digital Standards Converter
Optical Fiber Base Station AQ-BS200
Digital Serial Converter
D-1 VTR
Component Digital Equipment
D-2 VTR
AJ-D350
MII VTR AU-665
Composite Digital Equipment
Digital Processing Camera AQ-225

Digital Editing System



Optional Accessories



- Digital Video Remote Controller (AJ-ER30)
- Remote Control Cable (15m) (AJ-CC1515)
- Rack Mount Adaptor (AJ-MA35)
- Monitoring Software (AJ-SF30)
- Control Panel for AJ-D350 (AJ-CP30)
- Blank Panel for AJ-D350 (AJ-MA30)

Recommended Equipment

- Digital Serial Converter (Sprocket DST-1000)
- Digital Standards Converter (Accom D-Bridge 122)

D-3 Video Cassettes

- S-Cassette (AJ-TD30S/TD46S/TD60S$^+$)
- M-Cassette (AJ-TD30M/TD60M/TD90M/TD120M$^+$)
- L-Cassette (AJ-TD120L/TD180L/TD240L$^+$)
- Cleaning Cassette (AJ-TDCLS)

AJ-D350 Specifications (PAL)

General

Power Requirement:	100 to 120V AC, 200V to 240V AC ±10%, 50/60 Hz
Power Consumption:	Max. 450W
Operating Temperature:	5°C to 40°C
Humidity:	10% to 90% (non-condensing)
Weight:	Approx. 48 kg
Dimensions: (W × H × D)	Approx. 424 × 265 × 667 mm Including handles and feet
Recording Format:	D-3
Tracks/Channels:	Digital video and audio (4 channels): 8 tracks/field
	Analogue audio (cue): 1 track
	Time code: 1 track
	CTL: 1 track
Tape Speed:	83.88 mm/sec.
Record Time:	S: Max. 34 minutes with AJ-TD30S Max. 50 minutes with AJ-TD46S Max. 64 minutes with AJ-TD60S⁺ M: Max. 34 minutes with AJ-TD30M Max. 64 minutes with AJ-TD60M Max. 95 minutes with AJ-TD90M Max. 125 minutes with AJ-TD120M⁺ L: Max. 125 minutes with AJ-TD120L Max. 185 minutes with AJ-TD180L Max. 245 minutes with AJ-TD240L⁺
Cassette Type:	D-3 cassette (L, M, S size)
Recommended Tape:	Metal (1600 Oe) tape or equivalent
Servo Lock Time:	Within 1.5 sec. (with color frame capstan servo lock mode from standby mode)
Tape Timer Accuracy:	±1 frames (with continuous CTL signal)
Edit Accuracy:	0 frames (with time code)
FF/REW Time:	Within 90 sec. (with 90-minute tape)
Load/Unload Time:	Within 5 sec.
Cueing:	Within 5 sec. (30-sec. spot)

Video

Sampling Frequency:	4 Fsc ≃ 17.7 MHz
Quantization:	8 bits/±135° axis sampling
Channel Coding:	Advanced 8 ~ 14
Video Bandwidth:	0 to 6.0 MHz ±0.5dB, 7.5 MHz $^{+0}_{-3}$dB
S/N Ratio:	54dB
Differential Gain:	Less than 2%
Differential Phase:	Less than 1°
Moire:	0
Y/C Delay:	Less than 15 nsec.
Tilt (Horizontal & Vertical):	Less than 1%
Low Frequency Linearity:	Less than 2% (including quantization noise)
K Factor:	Less than 1%
Output SCH Phase:	Based upon CCIR Report 624-3
Input Level Adjustable Range:	±3dB (analogue input only)
Output Adjustable Range:	Video gain : − ∞ to + 3dB
	Chroma gain : − ∞ to + 3dB
	Chroma Phase : ±15°
	Black Level : ±100 WV
	Video phase : ±1.8μ sec. (226 nsec./STEP)
	Sync phase : ±1.8 μsec.
	SC phase : More than 360°

Digital Audio (DA 1 to 4 Channels)

Sampling Frequency:	48 kHz (synchronized to video)
Quantization:	20 bits/sample
Frequency Characteristic:	20 Hz to 20 kHz ±0.5dB
Dynamic Range:	More than 95dB (at 1 kHz, A weighted)
Distortion:	Less than 0.03% (at 1 kHz, emphasis OFF operating level)
Crosstalk:	Less than −80dB (at 1 kHz, between any two channels)
Wow and Flutter:	Below measurable limit
Headroom:	20dB
Operating Level:	+8, +4, 0, −20dBμ Switchable (LINE IN/OUT)
Emphasis:	T_1 = 50μsec, / T_2 = 15μsec. (ON/OFF selectable)
Input/Output Gain Range:	− ∞ to + 12dB

Analogue Audio (Cue Track)

Frequency Response:	100 Hz to 12 kHz ±3dB
S/N Ratio:	Better than 44dB (at 3% distortion)
Distortion:	Less than 2% (at 1 kHz, operating level)
Wow and Flutter:	Less than 0.15% (DIN weighted)
Operating Level:	Line In: +8, +4, 0, −20, −60dBμ Line Out: +8, +4, 0, −20dBμ switchable
Input/Output Gain Range:	− ∞ to + 12dB

Input/Output Signal

Video	
Input	
Analogue:	1.0 ±0.3 Vp-p, 75 ohms
Digital	10 bit parallel
Reference:	Composite (Black burst) signal Sync and burst 0.3 Vp-p, 75 ohms
Output	
Analogue:	Video 1 (VBS/VB/VS/V switchable) Video 2 (VBS) Video 3 (Character ON/OFF)
Digital:	10 bit parallel
Audio	
Input	
Analogue (CH 1, 2, 3, 4):	Max. +28dBμ (Nominal +8dBμ), 150 ohms/600 ohms/high impedance switchable
Digital (CH 1/2, 3/4):	AES/EBU format
Cue Line In:	Max. +18dBμ (Nominal +8dBμ), 150 ohms/600 ohms/high impedance switchable
Output	
Analogue (CH 1, 2, 3, 4):	Max. +28dBμ (Nominal +8dBμ), low impedance
Digital (CH 1/2, 3/4):	AES/EBU format
Cue:	Max. +18dBμ (Nominal +8dBμ), low impedance
Monitor L/R:	Max. +24dBμ (Nominal +4dBμ), low impedance
Headphones:	Variable level control by VR
General	
CF Pulse In/Out:	TTL level
WFM Out:	75 ohms Video/CTL/RF ENV CH0 or ENV CH1 (selectable)
Time Code	
Input:	2.4 V ±1.4 Vp-p, 10 kohms, balanced
Output:	2.4Vp-p, low impedance, balanced
Remote	
Remote-in:	For 9-pin RS-422A interface
Remote-out:	For 9-pin RS-422A interface
Remote-in/out:	For 9-pin RS-422A interface
RS-232C:	For RS-232C interface
GP-IB:	For GP-1B (IEEE-488) interface
Parallel I/O:	For parallel communication
V/A Control:	For video and audio remote control

Supplied Accessories

Extension Board	2
AC Power Cord	1
Digital Video Cable	1
Remote Control Cable	1

Weights and dimensions shown are approximate.
Specifications subject to change without notice.
This product may be subject to export control regulations.

*Matsushita Electric Industrial Co., Ltd., the parent company Panasonic, maintains one of the most extensive research and development programmes in the world.

⁺Avaiable within 1992.

Panasonic

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Netherlands: Tel. 31-7340-2505
Switzerland: Tel. 41-4157-9090

Sweden: Tel. 46-8680-8238
Belgium: Tel. 32-2-467-3694
Norway: Tel. 47-2-65-8400
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